

Abstract Submitted
for the DNP15 Meeting of
The American Physical Society

Spin and Isospin Dependent Interactions in Classical Molecular Simulations of Dense Nuclear Matter¹ CHARLEE AMASON, Agnes Scott Coll, MATT CAPLAN, CJ HOROWITZ, Indiana University — A neutron star is the hot, incredibly dense remnant of a massive star gone supernova. Extreme conditions on neutron stars allow for the formation of exotically shaped nuclear matter, known colloquially as nuclear pasta. Competition between the strong nuclear force and the repulsive Coulomb force results in frustration of the neutron star crust, ultimately resulting in these pasta shapes. Previous work at Indiana University has used classical molecular dynamic simulations to model the formation of this pasta. For this project, we introduce a similar model with a new spin dependent interaction. Using this model, we perform molecular dynamics simulations of both symmetric nuclear matter and pure neutron matter with 400 particles. The energies found are similar to those in chiral effective field theory calculations. When we include Coulomb interactions, the model produces pasta shapes. Future work will incorporate this spin potential into larger pasta simulations.

¹Supported by the National Science Foundation REU at Indiana University

Charlee Amason
Agnes Scott Coll

Date submitted: 23 Jul 2015

Electronic form version 1.4